CLAIMS

1. A hydraulic or pneumatic machine with vertical shaft, with tilting blades, characterized by the fact that, in view of converting the energy of a pressure fluid or of a fluid stream into mechanical energy and in view of achieving a simetrical fluid circulation in the machine, consists of a stator (A) made up of a cylindrical shell (I) provided with two openings radially arranged to diametrically oposed directions - one for fluid inlet (2), eventually in the form of a convergent nozzle and one for fluid outlet (3), eventually in the form of a divergent nozzle and two fixed or detachable lids - an upper (4) and a lower (5) one; two coaxial rotors rotating to opposite senses from one another - an upper one (B) and a lower one (C) - in form of disks, with parallel front faces, each consisting of a flat ring plane (6) provided on its front face, with several shaped grooves (b), equally spaced, wherein some tilting blades (12) are installed, coupled by means of a frame (7) - for the upper rotor (B) - to a disk (8) provided with a hub (10), fastened by elements known in themselves, onto an upper outlet shaft (52) - for the lower rotor (C) respectively - to a disk (9) provided with a hub (11) fixed on a lower outlet shaft (53), the two shafts getting out through some central orifices (w', x') of the lids (4, 5) respectively being supported in some radial - axial bearings (54) also provided with sealing elements, known in themselves, the outer ends of the shafts being capable to be coupled to a power consumer each or among them, through known means, in order to convey the motion to one outlet shaft (55); a number of tilting blades (12), each consisting of a rectangular panel (c) with a plane upper face (h) and a lower face, either plane (i) and parallel to the upper one, or curve (j), eventually provided with stiffening ribs (k) and a cylindrical hub (f), the outer face of which is tangent to the upper face (h) of the panel, provided with a central orifice (g) fitted with a shaft (15), each blade (12) being fitted in a groove (b), duly shaped to the lower face of the tilting blade, bordered at the outer end by a plane surface (o) provided with an orifice (p) and at the other end by a plane surface (q) with an orifice (r), the two orifices being coaxial meant to fasten some radial or axial - radial bearings (13) and (14) respectively, known in themselves, for hinged connecting of the blade (12) by means of the shaft (15), the grooves (b) being radially arranged on the front face of each rotor, so that each blade (12) should have the hub located to the moving sense of the respective rotor; one driving mechanism for each blade (12) made up of a lever (21) fixed on the end facing the inner side of the blade shaft (15), having at the free end a fixed shaft (22) with a roller (23) freely moving on it, all the rollers (23) on the upper rotor (B) being guided between the guiding front faces - the upper one (w) and the lower one (x) respectively - of a circular fixed cam (24), while those of the tilting blades on the lower rotor (C) between the guiding front faces - upper (y) and lower (z) - of another circular fixed cam (25), the two cams having the same profile permitting, during a complete rotor rotation, that each tilting blade (12) occupy, due to its own driving mechanism, during a rotation fraction - defined by a specific angle γ - an active position - on the angular sector γ_2 -wherein the upper face (h) of the blade is perpendicular to the rotor front face, or a passive position - on the angular sector γ_4 - where the upper face (h) of the blade is within the plane of the front surface of the rotor, the blade being situated in the shaped groove (b), or a transition phase from passive to active position - on the angular sector γ_1 - or from the active to passive position on the angular sector γ_3 - the cams being symmetrically arranged against the symmetry plane of the machine so that their guiding surfaces assure the symmetrical arrangement of the angular sector $\gamma_1 \div \gamma_4$ specific to a rotor as compared to those specific to the other rotor against the symmetry plan of the machine; a drum (D) consisting of a central body (45), with a cylindrical outer face, having the cams (24, 25) fitted inside, by means of some ribs (40) for instance, interlocked to a deflector (46) with symmetrical lateral surfaces (u') making a sharp angle between them and connected to

the outside face of the body (45), eventually provided with some gaps (v') having curve surfaces, permitting overlapping of the deflector (46) with the angular zone γ_1, and a rib (47), diametrically oposed, some fitted with stiffening plates (48, 49), fixed to the machine stator (A), in the symmetry plan of the machine, by means of spacers (50) and of one elements - screws, nuts - known in themselves, so that, inside the machine are formed two symmetrical, semicircular channels (a), having rectangular passage section, bordered by the front faces of the two rotors (B, C) moving to opposite sense to one another, the inner face of the stator (A) and the outer face of the drum (D), each taking over half of the inlet fluid flow to the machine, the cams (24, 25) profile assuring the tilting of the blades (12) on each of the two rotors in active position in one of the two semicircular channels (a) so that the fluid pressure in each channel, acting on the lower face (i) or (j) of a rotor blade, during the time it is in active position, obstructing the channel section, determines the movement of respective rotor to the flowing sense of the fluid, whereas, due to the fluid flowing to the same sense in the two channels (a), the rotors (B, C) rotate to opposite sense.

2. A hydraulic or pneumatic machine according to claim 1, **characterized by the fact that**, in a constructional variant, the tilting blade in active position makes an angle $\alpha < 90^0$ with the front face of respective rotor, for this purpose, its panel having the shape of a distorded rectangular, with two opposite sides (d, e) in the form of an elipse arc, so that, when the blade is in active position, all the points on the respective side be on the same cylindrical surface, the grooves (b) on the rotor face being bordered at their ends by curve surfaces (s, t) having the same profile as the sides of the blade panel.

3. A hydraulic or pneumatic machine according to claims 1, 2, **characterized by the fact that**, in a constructional variant, the axis of each tilting blade makes with the tangent to the inner circular outline of the plane (6), drawn to the intersection point of respective axis, a $\beta < 90^0$ angle with the vertex facing the rotor moving sense.

4. A hydraulic or pneumatic machine, according to claims 1 ÷ 3, **characterized by the fact that**, in a constructional variant, the ring plane (6) with shaped grooves (b) is replaced by an external stiffening ring (16) with orifices (p) for the blade bearings, fixed against frame (7) by means of rods (17), known in themselves, radially arranged, also used as position limiters for the tilting blades (12) in passive position on the rotor, being shaped for this purpose to the blades profile, in order to eventually take over the axial loads due to its own weight, on the external ring (16) of the rotor, between the blades bearings (13), some equally spaced bolts (18) being fixed, upon which some guiding rolls (19) with spherical face can freely rotate, those of the upper rotor (B), installed to the ring outside (16), being guided between a plane ring surface (u) of a cylindrical gap (v) provided at the upper side of the shell (1) and the upper lid (4) surface, whereas those of the lower rotor (C), installed to the ring inside (16), are resting against the lower lid (5) of the stator (A).

5. A hydraulic or pneumatic machine according to claim 4, **characterized by the fact that**, in a constructional variant, in the absence of the external ring (16), the tilting blades (12) are bracketed only in bearings (14) installed on the internal frame (7) of the rotor, also provided with position limiters (20) for blade support in passive position.

6. A hydraulic or pneumatic machine according to claims 1 ÷ 5, **characterized by the fact that**, in a constructional variant, the driving element of the blade is a pinion (26) fixed on the end of its shaft (15) and engaged with a tappet with rack (27) provided at the end with the shaft (22) on which, in free rotation, is the roller (23) guided by one of the two cams (24) or (25), the tappet being capable of executing a vertical translation movement in a guide of a casing (28) fixed on the rotor, a guide which can be located on one side (a') or the

other side (b') of the pinion, thus correlating the rotation sense of the tilting blade (12) to the movement sense of the tappet (27) so that the blade (12) tilting in active position occurs during the downward movement of the tappet (27) or during its upward movement respectively.

7. A hydraulic or pneumatic machine according to claims 1 ÷ 5, **characterized by the fact that**, in a constructional variant, the driving element of the blade is a cone pinion (29) fixed on the end of its shaft (15) and engaged with a cone gear with vertical shaft (30) coaxial and connected to a cylindrical gear (31) provided with a spindle (32) which can freely rotate in a bearing (c') of a protection casing (33) of the mechanism, installed on rotor, the cylindrical gear (31) engaging a rack tappet (27) provided at the end with the shaft (22) on which the guiding roller (23) freely rotates, the tappet (27) being capable of executing a horizontal translation movement in a guide of the casing (33) that can be located on one side (d') or the other side (e') of the cylindrical gear (31), thus correlating the moving sense of the tilting blade (12) to the moving sense of the tappet (27) so that the blade (12) tilting in active position occurs when the tappet (27) moves to the rotor outside or to the rotor center, respectively, all guiding rollers (23) of the upper rotor (B) blades being guided between two guiding surfaces - the outer one (f') and the inner one (g') - of a fixed radial upper cam (34) whereas those of the lower rotor (C) are guided between two guiding surfaces - the outer one (h') and the inner one (i') - of a fixed radial lower cam (35), the two cams having the same profile, being fixed by means of ribs (40) inside the drum (D) so that they be symmetrically arranged to the symmetry plane of the machine.

8. A hydraulic or pneumatic machine, according to claims 1 ÷ 5, **characterized by the fact that**, in a constructional variant, both the upper cam (24) and the lower one (25) have one guiding face each, the permanent contact of the roller (23) to them being secured by the pressure of the working fluid acted on the active face of the tilting blade, properly shaped, or by means of counterweights (36) properly installed on the lever arm (21) or its extension (j'), or by some duly stressed spring (37) between a point located on the rotor frame (7), for ex. an oriffice (k'), and a point located on the driving lever (21) of blade, for ex. an oriffice (l'), the rotation angle of the lever (21) being limited by means of a stop (38) fitted on the inner face of the frame (7).

9. A hydraulic or pneumatic machine according to claims 6 and 7, **characterized by the fact that**, in a constructional variant, the upper cams (24, 34) and the lower cams (25, 35) have one guiding face each, the rollers (23) being kept in permanent contact with the respective faces, either by the working fluid pressure acting on the active face of the tilting blade, duly shaped, or by means of springs (39) acting properly on the tappets (27).

10. A hydraulic or pneumatic machine according to claims 6 and 9, **characterized by the fact that**, in a constructional variant, the upper cam (24) has only the upper guiding face (w) and is located on the upper lid (4) of the casing (A) whereas the lower cam (25) has only the lower guiding face (z) and is located on the lower lid (5) of the casing (A), the protection casings (28) of the driving mechanisms of the blades (12) being installed with the guides (a') or (b') facing the faces of the respective cams the two rotors (B) and (C) having the disks (8) and (9) respectively provided with some orifices (m') corresponding to the position of the guides in order to allow the vertical gliding of tappets (27) with roller (23) under the action of compressed springs (39).

11. A hydraulic or pneumatic machine according to claims 1 ÷ 5, 8, **characterized by the fact that**, in a constructional variant, the tilting blades (12) of the upper rotor (B) are guided by an upper front cam (41) whereas those of the lower rotor (C) by lower front cam (42) fixed on the outer face of the drum (D), at its extremities, the panel of each blade having fixed on its upper face (h) a skid (43) with one end (r') of an adequate shape for the contact to the came face, eventually provided with a contact roller, known in itself, located in a gap (p') of the panel (e), the surface of the skid head being permanently in contact to the guiding

faces (n') and (o') of the two cams (41) and (42) respectively due to the driving mechanism installed on the lever (21) which, under this variant is devoid of the guiding roller (23).

12. A hydraulic or pneumatic machine according to claim 11, **characterized by the fact that**, in a constructional variant, the tilting blades (12) of the rotors (B) and (C) are each driven by a twisting spring (44) located in an orifice (s') in line with the hub (f), located at its end, the ends of the spring being fixed one in a gap (t') in the orifice (s') wall, whereas the other one in the orifice (k') of the rotor frame (7) so that the spring (44) should be stressed in order to assure the permanent contact between the curved end (r') of the skid (43) and the guiding face of the respective cam.

13. A hydraulic or pneumatic machine according to claims 11 and 12, **characterized by the fact that**, in a constructional variant, the tilting blades (12) can freely rotate on their shafts (15) directly fitted on the rotor in the orifices (p) and (r) provided to this effect, each blade being driven by the twisting spring (44) located in the orifice (s') of its hub (f).

14. A hydraulic or pneumatic machine according to claims 1 ÷ 13, **characterized by the fact that**, in a constructional variant, in view of diminishing the clearance between the outer edge of the blade in active position on the rotor and the cylindrical face of the casing (A), each semicircular channel (a) is provided with a cylindrical segment (51) fixed on the inner face of the shell (1) between the front faces of the two rotors (B, C) within the zone covered by the angle γ_2 run by the rotor blade in active position.

15. A hydraulic or pneumatic machine according to claims 1 ÷ 14, **characterized by the fact that**, in a constructional variant the two coaxial shafts get out through the same lid of the casing (A), either the upper (4) or the lower (5) one, the rotor adjacent to the respective lid being fixed onto a tubular shaft (67) having a central channel (y') getting out through the central orifice (w'), (x') respectively of the respective lid, resting on it by means of an axial - radial bearing (68) also provided with a sealing device, the other rotor being fixed on a central shaft (66) resting both in an axial - radial bearing (69), provided with a sealing device, mounted in the central channel (y') of the tubular shaft (67) and, eventually, in an additional bearing (70) provided on a lid in its vicinity, the outlet ends of the shafts being capable of getting separately coupled by a power consumer or betweewn them, by means known in themselves, in order to convey the motion to one outlet shaft (72).

16. A hydraulic or pneumatic machine according to claims 1 ÷ 4, 6 ÷ 15, **characterized by the fact that**, in view of increasing the passage section and, accordingly, the working fluid flow rate in the machine, it has channels (a) for fluid circulation arranged in a multistaged way, having equal or different dimensions from one stage to the other, in an even number of stages, consisting of a casing (A) inside of which being several rotors grouped by two packages each coupled to one of the motor shafts: a package (H) consisting of two extreme rotors with a front face each, provided with tilting blades, located face to face, one on a machine shaft - either the upper rotor (B) or the lower rotor (C), whereas the other, a ring rotor (E), different from constructional view point only through the lack of the coupling elements on the machine shaft - the disk (8) or (9) and the hub (10), (11) respectively - and, in case the machine has more than two stages, a number of intermediate, ring like rotors (G_1, G_2....) located between the extreme rotors, each consisting of a ring plane (6) fixed on a frame (7) and having two parallel front faces provided with the shaped grooves (b) locating the tilting blades (12), all the rotors of the package (H) having the tilting blades identical or different in terms of size and number from one stage to the other and arranged in such a way as to assure them the same moving sense, fixed between them by means of fastening plates (77) and some tie bars (76), equally spaced on parallel or concurrent directions on their outer outline, so that, the whole package (H), by the hub (10) or (11) on the rotor fixed on a shaft (B) or (C), conveys

the motion to the respective shaft of the machine (52, 67, 53) or (66) depending on the assembling variant chosen; a package (I) consisting of one or several intermediate rotors respectively, in the form of a disk (F_1, F_2.....) intercalated between the rotors of the other package, each consisting of a ring plane (6) fixed on a disk (9) or (8) provided with a hub (11) or (10) coupled to the other shaft of the machine (53, 66, 52) or (67), the plane (6) having two parallel front faces provided with shaped grooves (b) locating tilting blades (12) similar to those existing on the rotors of the other package (H) at the respective stage but arranged in such a manner as to assure the rotor (F_1, F_2....) a rotation movement to the opposite sense of the rotors of the other package - the distance between the front faces of the neighbouring rotors being constant at all the stages of the machine or different from one stage to the other, depending on blades width - the tilting blades (12) on the two front faces of each intermediate rotor (F_1, F_2.... G_1, G_2.....) being either coupled two by two, in view of synchronizing their movement, by means os some geared segments (81), permanently engaged, installed on the shaft of each blade, so that when one is driven - the leading blade - the other - the led blade - shall any moment take a symmetrical position to it; a number of drums (D_1, D_2....) equal to the number of machine stages, each located between the front faces of two neighbouring rotors rotating to opposite sense from one another, arranged in the same position with the deflector (46) and rib (47), the extremities of which do not surpass the rotors outline, in the symmetry plane of the inlet and outlet fluid connection respectively, the neighbouring drums being fixed to one another so that the rotors movement be not hindered, either through the outside of the disk like intermediate rotors (F_1, F_2....) by means of spacers (79) located between the fastening plates (48), (49) respectively coupled to the deflector (46) and to the rib (47) respectively, on each drum, or inside the frame of the ring like intermediate rotors (G_1, G_2...)by means of the spacers (79) located between some fastening rings (80) inside each drum, as part of its body (45), the whole drums package thus formed being fastened onto the casing (A) lid located in the vicinity of the extreme ring rotor (E) by means of shorter spacers (50) placed between the fastening ring (80) on the closest drum (D), to the lid and the respective lid (4) or (5), located inside the rotor frame (E); driving mechanisms of the tilting blades (12) for all the rotors of the machine, installed on the shaft of each blade or only on the shaft of the leading blades in the case of intermediate rotors (F_1, F_2... G_1, G_2...) with the blades on the two faces coupled by geared sectors (81), the fixed cams driving the respective mechanisms being arranged in such a way as to assure the simultaneous movement of the blades located on the same vertical generatrix of the respective package of rotors.

17. A hydraulic or pneumatic machine according to claim 16, **characterized by the fact that**, in a constructional variant, the rotors package fixed between them through the inside (I) consits of a single intermediate disk like rotor (F_1) located in the machine in the vicinity of the extrem rotor (B) or (C) of the other package of rotors (H) and a number of intermediate ring like rotors (G), all the rotors of the package being rigidly fixed between them by means of the longitudinal tie bars (76) and the fastening plates (77), equally spaced on the inner outline of each rotor frame (7), inside the drums (D), the whole package of rotors being coupled to the machine shaft by the hub of the disk like rotor (F_1), the stator (A) having the lid (4) or (5) located in the vicinity of the extreme ring rotor (E) of the rotors package fixed in between through the outside (H), shaped to the form of the ring rotors (G) and (E) making the two packages.

18. A hydraulic or pneumatic machine according to claim 16, **characterized by the fact that**, in a constructional variant, in view of making fluid circulation channels (a) multistaged in an uneven number of stages, has the rotors grouped into two packages with an equal number of rotors, each coupled to one of the

machine shafts: a package (J) consisting of an extreme rotor, with one front face, fixed on a machine shaft - either the upper rotor (B) or the lower rotor (C) - and a number of intermediate ring rotors (G_1, G_2....) with two front faces, all the package rotors being fixed between them by means of longitudinal tie bars (76) and of some fastening plates (77), fitted with tilting blades (12) on their front faces arranged in such a way as to assure them the same rotation sense, the whole package being coupled to the machine shaft (52, 67, 53) or (66) on which the extreme rotor (B) or (C) is fixed by its hub (10) or (11), depending on the assembling variant chosen; a package (K) consisting of the other extreme rotor, with one front face - either the lower (C) or the upper (B) rotor - and a number of intermediate disk rotors (F_1, F_2...) with two front faces, interspersed between the rotors of the other package (J), all the package rotors fixed each by its hub (11, 10), on the other machine shaft (53, 66, 52) or (67), having on their front faces the tilting blades (12) arranged in such a way as to assure them the same rotation sense, opposite to the other package of rotors (J), between the front faces of two neighbouring rotors, rotating to opposite sense from one another, existing one drum each (D_1, D_2....) located, with the deflector (46) placed in the symmetry plane of the inlet connection, the neighbouring drums being fixed one to the other by means of spacers (79) located between the fastening elements provided on each drum (48, 49, 80), the whole package of drums thus formed being fixed on the casing (A) lid located in the vicinity of extreme rotor (C) or (B) as part of the package of disk rotors (K), by shorter spacers (50) located at the outside of the rotor and between the plates (48) and (49) fitted on the closest drum to the lid and the respective lid (4) or (5).

19. A hydraulic or pneumatic machine according to claim 18, **characterized by the fact that,** in a constructional variant, the package of rotors fixed between them trough the inside (K) consists of a single intermediate disk rotor (F_1) located in the vicinity of the extreme rotor (B) or (C) of the other package of rotors (J), a number of intermediate ring rotors (G) and an extreme ring rotor (E), all the package rotors being rigidly fixed between them by means of longitudinal tie - bars (76) and of fastening plates (77), equally spaced on the outline of the inner frame (7) of each rotor, inside the drum (D), the whole package of rotors being coupled to the machine shaft by the hub of the intermediate disk rotor (F_1), the stator (A) having the lid (4) or (5) located in the vicinity of the extreme ring rotor (E), shaped to the form of the ring rotors (G) and (E) making the two packages.

20. A hydraulic or pneumatic machine according to claims 16 ÷ 19, **characterized by the fact that,** the ring plane (6) of the intermediate rotors (F, G) with tilting blades on both front faces is replaced by an external ring (16), concentric with the inner frame (7), fixed to it by means of some rods (17) eventually arranged radially,which can also serve as position limiters for the tilting blades (12) in passive position, being duly shaped for this function according to the blades profile, both the ring (16) and the frame (7) being provided with coaxial orifices (p) and (r) respectively for the installation of the bearings (13) and (14) respectively of the tilting blades (12) pairs.

21. A hydraulic or pneumatic machine according to claims 16 ÷ 20, **characterized by the fact that,** in view of reducing the thickness of the intermediate rotors (F, G) the latter have the tilting blades (12), placed in opposite positions on the two front faces, installed coaxially either in a seat resulting from the crossing of the shaped grooves (b) on the opposite faces of the rotor, or between the outer ring (16) and the inner frame (7), the rotor being provided with one row of coaxial orifices (p, r) for the installation of the joint bearings (13, 14) of the two blades, each blade having on its panel (c) edge one hub consisting of one or several elements (f), alternating with those making the hub of the pair blade, so as to make together a "hinge" type articulation, the two blades being fitted, by their hubs (f), on two coaxial shafts - one filled (15) and one tubular (78), coupled between them by some cone pinions (82) and (83), permanently engaged by a pinion (84) rotating freely on a

shaft (85) fixed onto the rotor, thus synchronizing the movement of the two tilting blades (12) when driving one of them - the leading blade - by means of the driving mechanism installed on its shaft (15, 78).

22. A hydraulic or pneumatic machine according to claim 21, characterized by the fact that, the intermediate rotors (F, G) have the tilting blades (12) located in opposite positions on the two front faces, installed coaxially, each being able of a free movement on the shaft (15) fixed in the coaxial orifices (p, r) of the rotor, driven either separately, by a spring (44) fitted in the corresponding orifice (s') of the hub of each blade and stressed between the gap (t') made in its wall and a fixed point on the rotor, eventually the orifice (k') of the inner frame (7), an orifice (z') respectively made either in the outer wall of the groove (b) or in the outer ring wall (16), or simultaneously by a single spring (44) installed in the seat formed of the orifices (s') drilled in the two neighbouring hubs (f) of the two face to face blades and stressed between the gap (t') made in their walls.

23. A hydraulic or pneumatic machine according to claims 16 + 21, characterized by the fact that, in a constructional variant, is provided with driving mechanisms with cams only for the tilting blades (12) on the rotors located either at the first or the last stage of the rotors package, the movement being simultaneously conveyed from each of them to all the leading blades existing on the same vertical in the respective package of rotors, either, in the case of the rotors package (H, J) fixed between them through the outside, by means of tie - bars (76) and fastening plates (77), by a joint rack (87), located in a casing (88) fitted on the perifery of the rotors making the respective package, engaged with some pinions (86) fixed at the outside of the rotor, on the end of each shaft (15) of the respective leading blades, or, in the case of the rotors package (I, K) fixed between them through the inside, with tie - bars (76) and fastening plates (77) or directly onto the machine shaft, by some driving elements similar to those of the driving mechanism - a lever (21) or a pinion (26) or a cone pinion (29) engaged with a cone gear (30) - installed on the end of each shaft (15) of the leading blades, located inside the rotor frame, the driving elements of the blades at all the stages of the rotors package found on the same vertical being coupled by some linking elements: a joint stem (89) hinged to a lever (21) in view of getting distortional parallelograms, or a joint vertical rack (90) which engages simultaneously the pinions (26) from all the stages and is provided at one end with a shaft (22) having the roller (23) in touch to the cam face of the driving mechanism, or a joint shaft (91) on which are fixed all the cone gears (30) of the rotors package found on the same vertical, the disks of all rotors making the respective package being provided with orifices (m') permitting the fitting of the mentioned linking elements (89, 90, 91).

24. A pneumatic machine according to claims 1 ÷ 3, 6 ÷ 13, 15, characterized by the fact that, in view of adjusting it to the use of some pressure fluids, within the annular space covered by the cylindrical shell (1) of the stator (A) and the cylindrical body (45) of the drum (D), interlocked to it, is provided a cylindrical ring (92) whose height corresponds to the distance between the rotors front faces (B, C), having on each front face a groove (a'') with variable depth wherein move the tilting blades (12) of the rotor bordering the respective surface - with baffles or sealing labyrinths, known in themselves, concentrically arranged on one or both edges of the channel, eventually at one or both its ends, on a radial direction - the two channels linking the inlet and the outlet fluids nozzles, in diametrically opposed positions, each having an initial zone (b'') with increasing depth to the rotation sense of the respective rotor, on the angular sector γ_1 characteristic for blade transition from the passive to the active position a middle zone (c'') opened towards the other rotor, with constant depth, equal to the cylindrical ring (92) height, on the angular sector γ_2 characteristic for keeping the blade in active position on the rotor, and a terminal zone (d'') with decreasing depth, on the angular sector γ_3 characteristic for the blade transition from active to passive position, the bottom and the side walls of the channel having the same profile

as the surfaces formed by the edges of the tilting blade (12) panel moving in the respective channel, whereas the interstice between the edges of the blade panel and the channel walls being minimum, so that inside each channel, between the adjacent blades on each rotor, some compartments are formed with a volume varying during the movement of the rotor, to the same sense with the variation of the channel depth; the pressure working fluid - coming from a storage tank or an outside combustion chamber (93) of a combustion mixture, known in themselves - entering the machine by a joint feed nozzle (2) or by separate nozzles (2), each connected to radial inlet channels (i'') executed in the cylindrical ring (92), gets into the initial zone (b''), simultaneously into both channels and separately respectively, into each one, either by some branches (j''), (u'') respectively of the inlet channel (i'') connected to a slot (k'') made on the shaped face (e'') of the channel bottom, and a groove (m'') respectively, with a variable or constant depth, made along a certain portion of the same surface, or by some slots (l'') executed along a certain length, in one or both lateral faces respectively - outside (g'') and inside (h'') one - of the channel, directly connected to the respective inlet channel (i''), the fluid pressure in each compartment covered between two successive blades of the rotor decreasing at the same time with the increase of its volume from a maximum value, in the compartments directly connected to the feed nozzle to a minimum value in the compartments located on the middle zone (c''), so that the driving forces determining the rotor movement should be exerted in all the compartments with increasing volume, located in the initial zone (b'') of the channel (a'') having variable values with time, proportional to the fluid instantaneous pressure and with the height difference between the vertex of the two blades delimitating the compartment, measured in the respective moment against the front face of the rotor, the torsion moment at the shaft of each rotor resulting from the sum of the moments given by the respective driving forces; the working fluid is discharged from each channel (a'') by a common outlet nozzle (3) or separate outlet nozzles (3), either by slots (o'') made in one or both the lateral faces - external (g'') or internal (h'') - along the entire length of the terminal zone (d''), communicating by some radial channels (r'') existing in the cylindrical ring (92) with the respective outlet nozzle (3), or by a groove (p'') with variable or constant depth made along the bottom surface (f'') of the terminal zone (d''), connected by slot (q'') to the corresponding radial channels (r'').

25. A pneumatic machine according to claim 24, **characterized by the fact that,** in a constructional variant, the cylindrical ring (92) is provided with a channel having a closed middle zone (c''), whose depth, correlated to the height of the tilting blade found in active position on respective rotor, is lower than the ring height (92), corresponding to the distance between the rotors front faces.

26. A pneumatic machine according to claims 24, 25, **characterized by the fact that,** in a constructional variant, when the height of the cylindrical ring (92) exceeds the sum of the maximum depths of the two channels (a'') on its front faces, the channels lengths can be increased so as they partially overlap in plane, being eventually connected to their own fluid inlet (2) and outlet (3) nozzles thus becoming independent to one another, the plane arrangement of the driving mechanism cam of the tilting blade (12) of each rotor (B) or (C) corresponding to the plane position of respective channel (a'').

27. A pneumatic machine according to claims 24 ÷ 26, **characterized by the fact that,** in a constructional variant, the bottom face (f'') profile on the terminal zone (d'') of the shaped channel (a'') differs from that described by the blade edges, the channel being able to have on this zone the same depth as the middle zone (c''), being devoid of the discharge groove (p''), eventually.

28. A pneumatic machine according to claims 25, 26, **characterized by the fact that,** in a constructional variant the channel (a'') of the cylindrical ring (92) is devoid of the middle zone (c''), the initial

zone (b'') with an increasing channel depth being directly connected to the terminal zone (d'') with decreasing channel depth.

29. A pneumatic machine according to claims 24 + 27, **characterized by the fact that**, in a constructional variant, the slots (l'') or the grooves (m'') for the liquid feed to the two channels (a'') are executed over their whole initial zone (b''), the liquid pressure being the same in all the compartments with increasing volume, the driving forces being exerted on the tilting blades (12) located in the middle zone (c'') of the channel (a'') due to the fluid pressure difference in the two zones (b'', d'') bordering it.

30. A hydraulic or pneumatic machine according to claims 24 ÷ 29, **characterized by the fact that**, in a constructional variant, by having each rotor driven by a momentum applied on its shaft so that the tilting blades (12) should run the channels with variable section (a'') to the opposite sense - the angle α vertex between the blade and the front face of the rotor being arranged to the opposite sense of rotation - operates as a hydraulic pump or compressor, the working fluid flowing through the variable section channels (a'') to the moving sense of the respective rotor blades, being sucked in the terminal zone (d'') of the respective channel through the discharge nozzle (3) becoming the suction nozzle, due to the increase of the volum of the mobile compartments formed on the rotor when running across this zone, and discharged through the suction nozzle (2) which became the discharge nozzle, at a pressure higher than the suction pressure.

31. A hydraulic or pneumatic machine according to claims 24 ÷ 30, **characterized by the fact that**, in a constructional variant, the rotors (B) and (C) have one or several concentric rows of tilting blades (12) that may differ from one another, from one rotor to the other or from one row to the other, in terms of shape, dimensions and position on rotor, each row of tilting blades being provided with a driving mechanism of its own, whereas, on the front face of the cylindrical ring (92), bordering the front face of the respective rotor, is a corresponding number of concentric channels (a_1'', a_2''.....) with variable depth, framed by baffles or sealing labyrinths eventually, in order to diminish the pressure losses between the neighbouring channels or to the outside, the orientation of the driving mechanisms of the tilting blades on each row of the rotor blades being correlated to the plane position of the channel (a_1'', a_2''.....) they run in, each channel (a_1'', a_2''.....) having an inlet (2) and outlet (3) connection of its own, so that on the surface of each rotor are formed independent circuits with the same or different fluids, the number of which is equal to the number of the concentric rows of tilting blades, the orientation of the angle vertex α formed between the blades of each row and the rotor surface - to the rotor moving sense or its opposite sense - determining the operating conditions of each circuit - motor, pump or compressor respectively, whereas the two outlet shafts of the machine, coupled to the rotors (B, C) can rotate to the same or opposite senses.

32. A hydraulic or pneumatic machine according to claim 31, **characterized by the fact that**, in a constructional variant, the variable depth channels (a_1'', a_2''..... a_i''.....a_n'') on the same or opposite surfaces of the cylindrical ring (92) are coupled between them either in series, one in continuation to the other, by a shaped intermediate channel ($t_{i,\ i+1}$'') connecting the terminal zone (d_i'') of a channel to the initial zone (b_{i+1}'') of the other channel, forming an independent circuit where the working fluid incoming and outgoing is carried out at the circuits ends whereas, by adequately chosing the section of each channel and the dimensions and number of the tilting blades (12) running in it, it is assured the steady increase and decrease respectively of the volum of each compartment covered between two successive tilting blades along the whole circuit, so that, depending on the moving sense of the blades in the channels, the fluid is subject from the circuit inlet to outlet to a prolonged expansions - compression respectively, or in parallel, with joint inlet and outlet connections, run to the same

sense by the rotor tilting blades, on the cylindrical ring (92) faces eventually existing simultaneously independent circuits formed of one channel and circuits formed of several channels, coupled in series or in parallel, each circuit running according to the tilting blades orientation against the rotor as a motor or as a pump, with the same or different fluids.

33. A hydraulic or pneumatic machine according to claims 16 ÷ 32, **characterized by the fact that,** in a constructional variant, is multistaged, the rotors of each stage - extreme (B, C) or intermediate (F, G) ones, with the same or different diameters - having the tilting blades arranged on one or several concentric rows, each drum (D) being fitted with a cylindrincal ring (92) provided with proper channels (a'') with variable depth, the channels (a'') provided at various stages of the machine being capable to be coupled between them by means of pipes (95) connecting the radial inlet (i'') - outlet (r'') channels respectively - from one stage to those of the other stage, according to the conexions plan chosen for the formation of a circuit, directly, if the two stages are consecutive, or by crossing the cylindrical rings (92) of the intercalated stages, provided for this purpose with some properly arranged radial channels (w''), communicating to the respective connecting pipes (95), the latter being located either to the outside of the cylindrical rings (92), or inside the drums (D), in the same way as the fastening elements of the neighbouring drums (D), the position of the inlet (i'') - outlet (r'') radial channels - to the outside or the inside of the cylindrical ring (92) - being determined by the position of the respective connecting pipe, whereas the inlet (2) and outlet (3) nozzles of the machine, for each circuit, are located on the cylindrical ring (92) making part of the drum (D) directly mounted on the machine casing.

34. A hydraulic or pneumatic machine according to claim 33, **characterized by the fact that,** in a constructional variant, the fastening of the cylindrical rings (92) located on both sides of the rotors (F, G) faces with tilting blades on the both faces is achieved by means of spacing rings (94) placed between the two adjacent, cylindrical rings (92), concentrically to them - either outside the disk rotors (F) or inside the ring rotors (G) - which can be provided with some channels (u'') and (v''), linked to the inlet (i'') - outlet (r'') channels respectively, made in the neighbouring cylindrical rings (92) in order to couple the fluid circuits of the various stages of the machine.

35. A hydraulic or pneumatic machine according to claims 33, 34, **characterized by the fact that,** in a constructional variant, the tilting blades (12) on the each front face of the intermediate rotors (F, G) are driven by a mechanism of their own, dismissing the permanent coupling of the tilting blades located on the opposite faces of the rotors by geared sectors (81) so that the cams pairs of the independent driving mechanisms of the blades at each stage can have a different plane arrangement from one stage to the other, according to the arrangement of the channels with variable sections (a'') the tilting blades (12) run in, on the respective stage and row.

36. A hydraulic or pneumatic machine according to claims 33 ÷ 35, **characterized by the fact that,** in a constructional variant, in view of diminishing the resulting axial forces acting on the two shafts, the rotors packages consist only of rotors with tilting blades (12) on both faces - either a disk rotor (F) coupled to each of the machine shafts or a package (I) of disk rotors (F), each coupled directly to one of the machine shaft, and a package (J) consisting of ring rotors (G) and an extreme rotor (B) or (C) devoid of tilting blades on its front face, meant only to couple the whole package (J) to the other machine shaft by its disk (8, 9) respectively, extended up to the machine periphery, and its hub (10, 11) respectively, as part of it, whereas the cylindrical rings (92) fitted on the drums (D) of each stage, have corresponding channels (a''), with variable depth, on one or both front faces as they border one front face with tilting blades (12), in the case of the rings located at extremities, or two front faces with tilting blades (12) in the case of those located in intermediate positions, in the

particular case when the tilting blades on the two front faces of each rotor are identical as form and arrangement and the fluids pressure in the corresponding channels (a'') with variable depth are equal, the axial force is zero.

37. A hydraulic or pneumatic machine according to claims 25 ÷ 32, **characterized by the fact that,** in a constructional variant has both extreme rotors (B, C) mounted on the same outlet shaft of the machine, the orientation of the tilting blades (12) on the front faces of the rotors and that of the corresponding channels with variable depth (a'') on the cylindrical ring (92) determining the same moving sense of the two rotors.

38. A hydraulic or pneumatic machine according to claims 25 ÷ 32, **characterized by the fact that,** in a constructional variant, has a single extreme rotor (B) or (C) provided with one or several rows of tilting blades (12), the cylindrical ring (92) having, accordingly, one or several channels with variable depth (a'') on the neighbouring face of the rotor and being fastened on the lid (5), (4) respectively opposite to the respective rotor.

39. A hydraulic or pneumatic machine according to claims 25 ÷ 36, **characterized by the fact that,** in a constructional variant, in view of diminishing the resulting axial force acting on the rotor, has either a single disk type rotor (F) with tilting blades (12) on both faces, or several disk type rotors (F) spaced between them, in the form of package (I) of rotors mounted on a single machine shaft (52) or (53), eventually capable of free axial movement on it, two cylindrical rings (92) with variable depth channels (a'') on one face, mounted on the upper (4) and lower (5) lids of the casing (A) and a number of cylindrical rings (92) respectively, with variable depth channels (a'') on both faces, located between the front faces of the neighbouring rotors.

40. A hydraulic or pneumatic machine according to claims 25 ÷ 36, **characterized by the fact that,** in a constructional variant, in view of diminishing the resulting axial forces acting on the shaft, has either a single ring type (G) rotor with tilting blades on both faces, or several ring type (G) rotors spaced between them, and an extreme rotor (B) or (C) devoid of tilting blades on its front face, all making a package of rotors fixed on the motor outlet shaft (52) or (53) by the disk (8) or (9) extended up to the extreme rotor periphery (B) or (C) and by the its hub (10) or (11), or it can freely move axially on the respective shaft, two cylindrical rings (92) with variable depth channels (a'') on one face and, eventualy, a number of cylindrical rings (92) with variable depth channels (a'') on both faces, located between the neighbouring front faces provided with tilting blades.

41. A pneumatic machine according to claims 24 ÷ 28; 30 ÷ 40, **characterized by the fact that,** in a constructional variant the working fluid consists of the gases resulting from fuel combustion in a combustion chamber equipped with devices for the supply, formation and ignition, of fuel mixture, all known in themselves, located either outside (93) or inside (s'') the machine, id est in a cylindrical ring (92) or in a ring spacer (94) connected, by means of the inlet connection (2) by one or several radial channels (i'') respectively, to the channels with variable depth (a'') of a motor circuit wherein the tilting blades of the rotors run, the compression of the air or of the fuel mixture fed into the combustion chamber being achieved either in a separate compressor or in a pumping circuit consisting of one or several channels with variable depth (a'') inside the same machine.